REMARKS

Applicants thank the Examiner for the Examiner's timely and thorough search of the art and Office Action. Applicants, by this Amendment, have amended the Claims to overcome all deficiencies noted in the Examiner's Office Action. No new matter has been entered by this Amendment. After entry of this Amendment, Claims 1 – 19 are pending in the Application.

The Specification has been amended solely to correct typographical errors discovered while reviewing the application in preparation for responding to the Office Action. No change in the scope of the invention is intended or effected by changes made to the Specification in this Amendment.

**In the Office Action, the Examiner rejected Claims 1 – 18 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 35 103(a) as obvious over U.S. Patent 6,751,566 to Temple et al. (hereinafter referred to as "Temple").**

**Regarding Claims 1 – 15 and 18, the Examiner stated that Temple discloses a method of determining refrigerant charge level in an air-conditioning system. Referring to Fig. 6 of Temple, the Examiner stated that the Temple system comprises a compressor 18, a condenser 12, an evaporator, first sensor 90 measuring the temperature within the condenser, second sensor 28 measuring the temperature liquid refrigerant and microcontroller 94. The Examiner stated that subcooling is computed by subtracting liquid refrigerant temperature measured by sensor 28 from the condenser refrigerant temperature measured by sensor 90. The refrigerant charge level determination algorithm determines the refrigerant charge level based on the input from sensors. The Examiner stated that Temple discloses when the predicted charge level is outside of the desired range, the offset from normal charge level is computed and a charge level adjustment is indicated to the user. The Examiner stated that a service technician or other user can add or subtract refrigerant charge to bring the charge within acceptable limits. Therefore,**

**according to the Examiner, the access fittings are inherent in the charging device to make the adjustment.**

**Regarding Claims 16 and 17, the Examiner stated that it is well settled that it is not "invention" to broadly provide a mechanical or automatic means to replace manual activity which has accomplished the same result or vice versa [citing In re Rundekk; 18 CCPA 1290, 48 F.2d 958, 9 USPQ 220].**

Applicants respectfully traverse the Examiner's rejection of Claims 1 – 18 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 35 103(a) as obvious over Temple.

The present invention involves measuring of two temperatures – (1) temperature of the refrigerant in the system in a saturated state and (2) temperature of the refrigerant in a liquid state. The present invention (as now claimed) assures proper temperatures are sampled by measuring the desired temperatures in predetermined loci at which it is assured that proper temperatures may be sensed. This choosing of refrigerant-saturated-assured and refrigerant-liquid-assured loci is not new material. In the Specification it is stated:

> Installing a temperature sensing device 60 in saturation-assured portion 58 assures that temperatures measured by temperature sensing device 60 are indicating saturated temperature ($T_{SATURATED}$) of refrigerant within cooling system 10. Installing a temperature sensing device 62 between condenser exhaust 56 and expansion valve 24 assures that temperatures measured by temperature sensing device 62 are indicating liquid temperature ($T_{LIQUID}$) of refrigerant within cooling system 10. [Specification; page 6, lines 13 – 18]

Temperature measurement is commonly carried out by sensing temperature at the outside wall of a fluid line – such as the fluid line comprising condenser coil 17 or fluid line 22. This is a common practice known by those skilled in the art of air conditioning system design. No breaching of cooling system 10 is occasioned by the temperature measurements recited in the Claims. Thus, there is no risk of measurements for

evaluating operation of cooling system 10 causing a breaching any of compressor 12, evaporator 14, condenser 16, expansion valve 24 or fluid lines 18, 20, 22, 26. Consequently, there is no risk of loss of refrigerant occasioned by carrying out measurements for evaluating operation of cooling system 10 as claimed.

In contrast, Temple requires obtaining pressure measurements for carrying out his disclosed method for determining charge level in an air conditioning system.

> In accordance with the preferred embodiment of the invention, the at least one system operating parameter includes refrigerant subcooling, refrigerant superheat, liquid refrigerant pressure on a discharge side of the condenser and vapor refrigerant pressure on a suction side of the compressor. These four parameters are used to determine refrigerant charge level based on the predetermined relationship between charge level and each of these parameters. [Temple; Col. 2, lines 5 – 14; emphasis added]

> The temperature measurements from sensors 28, 32 and the pressure measurements from sensors 30, 34 are transmitted to an interface module 36.... [Temple; Col. 3, lines 47 – 49; emphasis added]

Those skilled in the art of air conditioning system design know that measurement of pressure of a fluid (e.g., a refrigerant) in a fluid line requires a breaching of the fluid line, with an added risk of loss of fluid from the fluid line if the pressure sensor-to-line seal is not secure.

Avoiding risk of loss of fluid from a fluid line is one of the objects of the present invention. [Specification; page 3, lines 25 – 28] Temple's necessity of using pressure measurements (see cited passages from Temple above) clearly teaches away from the fluid-integrity-assuring approach employed by the present invention because Temple requires at least two pressure measurements for practicing his invention – (1) liquid refrigerant pressure and (2) vapor refrigerant pressure.

Further, the present invention uses only two temperature measurements and subtracts those two temperature measurements to derive a measure of subcooling. Subcooling is the sole measure employed by the present invention for evaluating operation of the cooling system of the present invention. In contrast, subcooling is only one of four parameters used by Temple for determining refrigerant charge level in an air conditioning system.

> ...refrigerant charge level is a function of condenser subcooling (SC), evaporator superheat (SH), liquid refrigerant pressure ($P_{liqv}$) and vapor refrigerant pressure ($P_{suct}$). [Temple; Col. 3, lines 56 – 59]

Applicants respectfully submit that Temple does not anticipate, disclose, teach, show, suggest, infer or in any way render obvious the present invention as claimed in Claims 1 – 18. It is respectfully submitted that Claims 1 – 18 patentably distinguish over Temple.

**The Examiner continued in the Office Action, rejecting Claims 1 – 18 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,484,452 to Houser, Jr. (hereinafter referred to as "Houser") in view of Japanese Patent JP03195829 to Inoue (hereinafter referred to as "Inoue").**

**The Examiner stated that Houser discloses an air-conditioning charge control system. Referring to Houser; FIG. 1, the Examiner stated that the Houser system comprises a compressor 13, a condenser 12, an evaporator 11, fitting 16e, refrigerant vessel 21, controller 28, temperature sensors and pressure sensors. The Examiner stated that superheating and subcooling strategies are employed to maintain the charge level in the circuit at optimum performance level. Additional control strategy is employed to shift refrigerant charge into and out of the circuit transient operations.**

**According to the Examiner, under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process [citing In Re King; 801 F 2d 1324, 231 USPQ 136 (Fed. Cir. 1986)]. According to the Examiner Houser discloses the invention substantially as claimed. However, the Examiner observed, Houser does not disclose the claimed subcooling calculation According to the Examiner, Inoue discloses subcooling based on the temperature difference between refrigerant temperature measured by sensor 11 from the condenser refrigerant temperature measured by sensor 12 in the same field of endeavor for the purpose of calculating subcooling. Therefore, according to the Examiner, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the apparatus of Houser with a subcooling calculation in view of Inoue so as to have alternative subcooling estimate.**

Applicants respectfully traverse the Examiner's rejection of Claims 1 – 18 under 35 U.S.C. 103(a) as being unpatentable over Houser in view of Inoue.

As mentioned above in connection with the Examiner's citation of Temple, the present invention involves measuring of two temperatures – (1) temperature of the refrigerant in the system in a saturated state and (2) temperature of the refrigerant in a liquid state. The present invention (as now claimed) assures proper temperatures are sampled by measuring the desired temperatures in predetermined loci at which it is assured that proper temperatures may be sensed. This choosing of refrigerant-saturated-assured and refrigerant-liquid-assured loci is not new material. In the Specification it is stated:

> Installing a temperature sensing device 60 in saturation-assured portion 58 assures that temperatures measured by temperature sensing device 60 are indicating saturated temperature ($T_{SATURATED}$) of refrigerant within cooling system 10. Installing a temperature sensing device 62 between

> condenser exhaust 56 and expansion valve 24 assures that temperatures measured by temperature sensing device 62 are indicating liquid temperature ($T_{LIQUID}$) of refrigerant within cooling system 10. [Specification; page 6, lines 13 – 18]

Temperature measurement is commonly by sensing temperature at the outside wall of a fluid line – such as the fluid line comprising condenser coil 17 or 22. This is a common practice known by those skilled in the art of air conditioning system design. Thus, no breaching of cooling system 10 is occasioned by the temperature measurements recited in the Claims. Thus, there is no risk of measurements for evaluating operation of cooling system 10 causing a breaching of any of compressor 12, evaporator 14, condenser 16, expansion valve 24 or fluid lines 18, 20, 22, 26. Consequently, there is no risk of loss of refrigerant occasioned by carrying out measurements for evaluating operation of cooling system 10 as claimed.

In contrast, Houser <u>requires</u> obtaining <u>pressure measurements</u> for carrying out his disclosed method for determining charge level in an air conditioning system.

> The improvement of the invention further comprises means for sensing refrigerant temperature <u>and pressure</u> at predetermined points in the refrigerant circuit and control means responsive to the sensed temperatures <u>and pressures</u> for controlling operation of the three valves. [Houser; Col. 2, line 64 – Col. 3, line 1; emphasis added]

> Means for sensing refrigerant temperature <u>and pressure</u> at various points in the refrigerant circuit includes temperature sensors $T_1 - T_{10}$ and <u>pressure sensors $P_1$ ... and $P_2$</u> .... [Houser; Col. 3, lines 53 – 56; emphasis added]

Those skilled in the art of air conditioning system design know that measurement of pressure of a fluid (e.g., a refrigerant) in a fluid line requires a breaching of the fluid line, with an added risk of loss of fluid from the fluid line if the pressure sensor-to-line seal is not secure.

Avoiding risk of loss of fluid from a fluid line is one of the objects of the present invention. [Specification; page 3, lines 25 – 28] Houser's using pressure measurements (see cited passages from Houser above) clearly teaches away from the fluid-integrity-assuring approach employed by the present invention.

The differences between the present invention and Houser's disclosed system are significant. The present invention does not rely upon pressure measurements in any manner. In contrast, Houser relies upon pressure measurements for operating his refrigerant charge control system. Such a significant difference between the present invention and Houser's disclosed system certainly precludes application of any principle of inherency to justify rejecting the present claims under 35 U.S.C. 103(a) as being unpatentable over Houser.

Further, the present invention uses only two temperature measurements and subtracts those two temperature measurements to derive a measure of subcooling. Subcooling is the sole measure employed by the present invention for evaluating operation of the cooling system of the present invention. Houser discloses using a superheat strategy or a subcooling strategy for carrying out the principles of his invention. However, Houser requires pressure information for his super heat strategy:

> As is well known, superheat is the amount of increase in vapor temperature beyond its saturation temperature for a given pressure level, which requires the measurement of both pressure and temperature to determine. [Houser; Col. 4, lines 49 – 53; emphasis provided]

Houser also requires pressure information for his subcooling strategy:

> As in the case of superheat, while subcooling can be determined from sensed pressure and temperature at the corresponding coil outlet, it may be more practical .... to use sensed temperature at the coil outlet .... and sensed pressure at the compressor discharge line.... [Houser; Col. 5, lines 10 – 16; emphasis provided]

Inouye discloses using a subcooling calculation. However, Inoue requires an additional consideration regarding room temperature t as compared with a set room temperature $t_s$ in effecting control of flow of refrigerant in his system. Inoue does not rely solely on a subcooling parameter for evaluating performance of his cooling system. As a result, Inoue does not aid in overcoming the previously mentioned shortcoming of Houser's requiring pressure measurements for carrying out the principles of his invention. Nor does Inoue alone provide a basis for rejecting patentability of the present invention.

Applicants respectfully submit that neither Houser, nor Inoue nor any combination of Houser and Inoue anticipates, discloses, teaches, shows, suggests, infers or in any way renders obvious the present invention as claimed in Claims 1 – 18. It is respectfully submitted that Claims 1 – 18 patentably distinguish over Houser, over Inoue and over any combination of Houser and Inoue.

New Claim 19 depends from patentable Claim 18 and is therefore itself patentable.

Since Applicants have fully and completely responded to the Official Action, this Application is now in order for early action and such early action is respectfully requested. If the Examiner would deem a telephone conference to be of value in expediting this Application, the Examiner is invited to call the undersigned attorney at (972) 662-9378 at the Examiner's convenience.

Respectfully submitted,

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Donald D. Mondul, Attorney for Applicants